

S
639.313
F2mcf
1984

MIDDLE CLARK FORK RIVER
FISHERY MONITORING STUDY:

Evaluation of the Effects of Pulp and Paper
Mill Effluents on the Fish Population

by

Montana Department of Fish, Wildlife & Parks

STATE DOCUMENTS COLLECTION

May, 1984

MAY 18 1993

MONTANA STATE LIBRARY
1515 E. 6TH AVE.
HELENA, MONTANA 59620

PLEASE RETURN

11/10/91 87305

AUG 22 1996

MONTANA STATE LIBRARY
S 636.312 F2mcf 1984 c.1
Middle Clark Fork River fishery monitor



3 0864 00075900 4

Scope

The Clark Fork River has been assimilating man's domestic, agricultural and industrial wastes for nearly a century. Newspaper accounts of the heavy pollution, nearly 30 years ago, indicate that water quality has been worse than it is at the present time. Very little quantitative information has been collected to document the condition of the fisheries or the range of conditions which have existed.

In order to evaluate the river's ability to safely assimilate additional quantities of pulp mill wastes, the current status of the sportfish populations needs to be determined to identify factors which may contribute to problems in the fish population. This study would be conducted in coordination with water quality studies being conducted by the Department of Health and Environmental Sciences. The water quality studies, as presently designed, are extensive as opposed to intensive site investigating. Therefore, the fishery study would be designed similarly. The study would attempt to quantify the condition of the trout populations in the river, to detect problems with trout production, identify other indicators which may better reflect problems in the trout population such as sculpins or crayfish, and recommend remedial action based on the results. The study area will extend from Milltown Dam to the mouth of the Flathead River (Figure 1).

There are several problems in designing this study. First, the study is intended to document an impact from the effluent of Champion's Pulp Mill after the discharges have already begun. Second, there is very little baseline information on the fish population or other aquatic biota downstream from Champion. Third, the time frame for the study is limited to two summer and one winter field seasons. Fourth, there are many other water quality problems which affect fish in the Clark Fork River.

For these reasons, the scope of the study has been broadened with additional assistance being provided by the Department of Fish, Wildlife and Parks (DFWP). For example, to assist in identifying the influence of metals on aquatic biota we propose to analyze crayfish tissue samples. Metals originating from tailings in the Upper Clark Fork are gradually diluted as the Clark Fork receives more good quality dilution water from downstream tributaries. However, monitoring has not been intensive enough, particularly from Milltown Dam downstream, to determine how often, if at all, metals criteria are exceeded. Limited work on crayfish tissue analysis was done in the vicinity of the pulp mill in 1977 (Gordon by Silverman, 1983).

There has also been speculation that downstream reservoirs (Noxon, Thompson Falls) act as sinks for metals and that organic deposits originating from domestic or industrial sources may cause reducing conditions at the sediment water interface, thereby releasing metals present in the sediments.

Crayfish were chosen as the indicator organism because their movements are confined to a relatively small area. Cadmium and copper will be monitored because both of these are known to exceed criteria for protection of aquatic life in the Upper Clark Fork. Metals concentrations in crayfish exoskeleton may prove to be a good integrator of past history of exposure to metals.



Figure 1. Map of Clark Fork Drainage





We also recognize that there is a need for a comprehensive evaluation of the Clark Fork River system which cannot be accomplished within the scope of this study. The comprehensive study should include quantification of instream flow requirements for sport fish in the main river as well as major tributaries, expand sampling to below the mouth of the Flathead River, assess seasonal and temporal distribution and movements of sport fish during both juvenile and adult life stages, provide seasonal mortality estimates of fish, identify interactions between fish populations and water quality relative to the influence of tributary streams.

Some of the above mentioned activities will be studied under a department project which has been redirected to the Clark Fork River. These activities are presently being prioritized in developing a new scope of work for the state project. Although the project is not expected to be completed in the short time frame required for the Champion EIS, the data collected to that date will be made available.

Objectives

1. To determine distribution, species composition, and relative condition of fish populations in the Clark Fork River from Milltown Dam downstream to the Flathead River.
2. To monitor the condition of the river and intergravel environment relative to egg survival for fall and, if possible, spring spawners depending on location and timing of spawning and emergence.
3. Try to determine the metals exposure regime for various reaches of the Clark Fork River using metals analyses of an appropriate biological indicator species.
4. To correlate parameters, identified in the water quality study with relative abundance of the fishery in the Clark Fork River.
5. Identify factors which may contribute to the absence of a brown trout fishery in the Clark Fork River below Missoula.

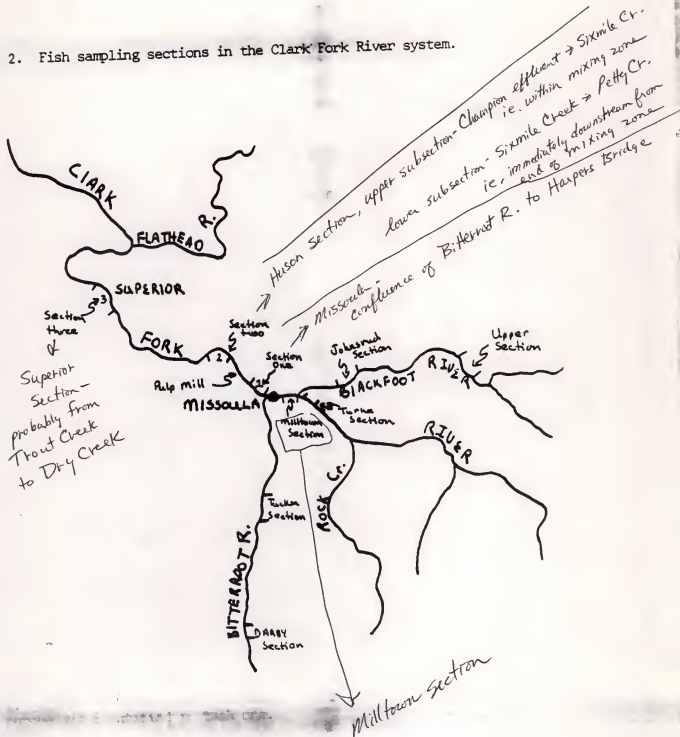
Tasks

Objective 1.

1. Establish three fish population sampling sections. The uppermost would be between the pulp mill and the mouth of the Bitterroot. The second between the pulp mill and Petty Creek. The third near Superior (Figure 2). These stations will help distinguish the pulp mill from possible effects on the fishery from the Missoula sewage treatment plant.
2. In addition, the Department will monitor sections in the lower Blackfoot River and Clark Fork River above Milltown Dam as control sites.
3. Physical characteristics of each study reach will be determined.
4. Estimate trout populations or determine relative abundance in each study reach.



Figure 2. Fish sampling sections in the Clark Fork River system.





5. Conduct survey electrofishing to determine relative abundance of juvenile trout rearing in the study reaches.
6. Conduct survey electrofishing to document species of nongame fish present and their relative abundance.
7. Determine condition factors, age and growth and age composition of the trout population.

Objective 2.

1. Conduct a visual survey of the river during the summer to identify potential areas for spawning.
2. Conduct electrofishing surveys during the spring and fall to locate concentrations of spawning fish.
3. Conduct additional surveys during the fall spawning season to locate actual spawning areas.
4. Monitor egg and fry survival in natural or artificial spawning sites in the main river if suitable habitat is located.
5. Monitor intergravel water quality.
6. Assess spawning bed composition.
7. Monitor river flow and temperature at the study sites.

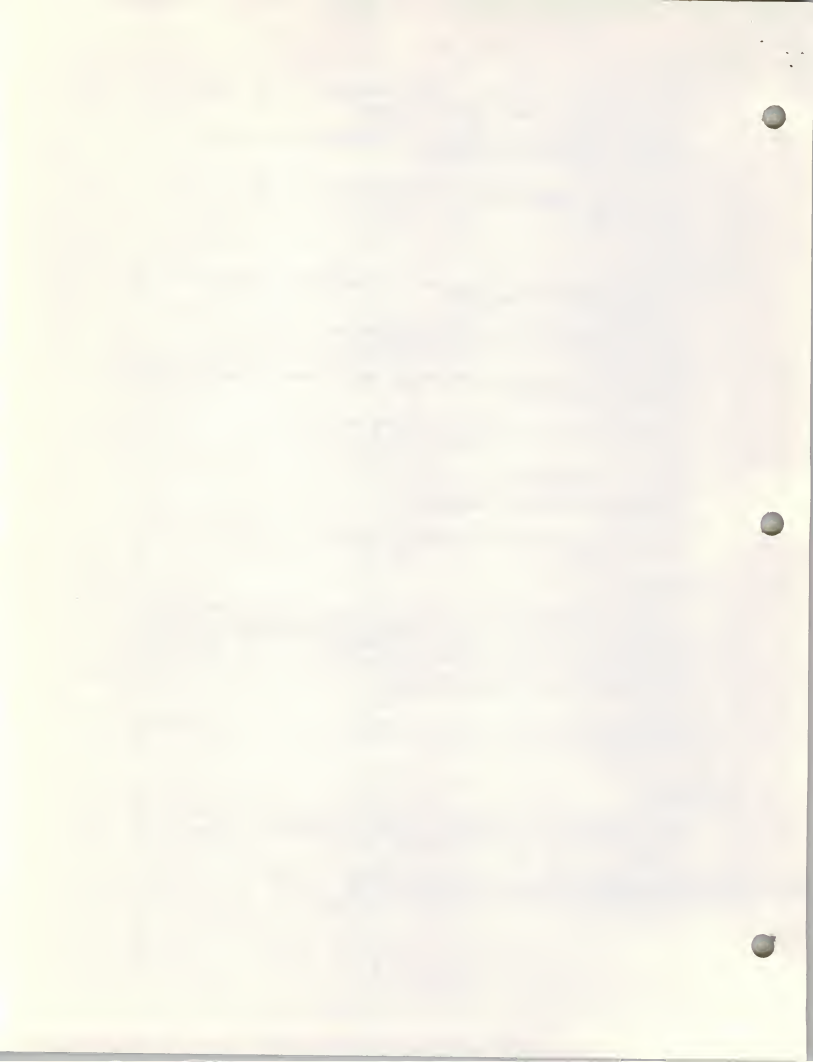
Objective 3.

1. Collect crayfish from several locations in the Clark Fork River and determine concentrations of copper and cadmium in exoskeleton. Sampling locations will include below Milltown Dam, below the Missoula sewage outfall, below the Champion International outfall, in the Bitterroot River (control), near Superior, below the Flathead River, below Thompson Falls Reservoir, below Noxon Reservoir.

The Department may add additional sampling stations in the upper Clark Fork River if sufficient crayfish can be located.

Objective 4.

1. Review water quality study to identify parameters and habitats in which changes of the parameters would be suspected to influence trout growth, survivability or distribution.
2. Compare the relative distribution of fish in the river to those parameters identified in task one.



Objective 5.

1. This objective would be addressed with the same procedures used in objective four, but would also be dependent on availability of data from the Upper Clark Fork River. Fish population sampling by the Department will occur in the Turah section upstream from Milltown Reservoir and in the lower Blackfoot River for comparative purposes.

Methods

Objective 1.

1. Physical parameters such as stream gradient, average width and channel development will be documented to identify differences between reaches which might in part explain differences in the fisheries.
2. Fish populations will be sampled with boom suspended and mobile electrofishing apparatus. Relative abundance will be determined by counting the number of fish samples per unit of time and lineal stream distance. Trout population estimates will be made using the Chapman modification of the Peterson mark/recapture technique as described by Vincent (1971 and 1974).
3. Scales will be collected from fish sampled by electrofishing for age and growth determination and to evaluate age composition of the population. Imprints of the scales will be examined under magnification to determine age. Age and growth of fish will be determined by backcalculation.

Objective 2.

1. Survey of river for spawning gravels would be conducted during the summer by boat. Additional aerial surveys may need to be conducted.
2. Boom-mounted electrofishing boat will be used to sample the river during the spring and fall spawning periods to locate concentration of fish in spawning fish.
3. Surveys for spawning sites during the fall would be conducted by boat and on foot. Characteristics of each spawning site would include depth, water velocity and size.
4. Egg to fry survival would be monitored in either natural or artificial spawning beds or both if natural spawning sites can be located.
 - Eyed eggs and sac fry alevins in the gravel will be sampled using a hydraulic egg sampler and kick net (Graham et al 1980).
 - Eggs will also be monitored in experimental plants using fiberglass screen bags buried in the gravel (Frealey and McMullin 1983).
5. Intergravel water quality will be monitored using stand pipes and a hand operated rotary pump (Decker-Hess and Graham 1982). Water quality parameters to be measured include D.O., pH, hardness, ammonia, and methals (ca and Cd). Analysis will be conducted by DHES.

Intergravel
water quality
parameters

salinity
temperature

6. Composition of spawning beds will be assessed to determine the percentage of fine materials using a core sample (Shepard and Graham 1983).

Objective 3.

1. Crayfish will be collected in traps just prior to the mid-summer molting period. Attention will be given to crayfish of similar size to try and eliminate as much as possible any variation due to age. Crayfish will be frozen after collection and skeletons later removed. Metals concentrations will be determined by atomic absorption spectrophotometry.



LITERATURE CITED

- Decker-Hess, J., and P. J. Graham. 1982. Impacts of water level fluctuations on kokanee reproduction in Flathead Lake. Montana Department of Fish, Wildlife and Parks, Kalispell, Montana, USA.
- Fraley and McMullin. 1983. Effects of the operation of Kerr Dam and Hungry Horse Dams on the kokanee fishery in the Flathead River System. Annual Progress Report. Montana Fish, Wildlife and Parks, Kalispell, Montana.
- Graham, P. J., S. L. McMullin, S. Appert, K. J. Fraser, and P. Leonard. 1980. Impacts of Hungry Horse Dam on aquatic life in the Flathead River. Montana Department of Fish, Wildlife and Parks, Kalispell, Montana, USA. 91 pages.
- Shepard, B. B., and P. J. Graham. 1983. Fish resource monitoring program for the Upper Flathead Basin. Montana Department Fish, Wildlife and Parks, Kalispell, Montana. 61 pages plus appendices.
- Silverman, A. J. 1983. A Preliminary Investigation Into the Use of Crayfish as a Sensitive Species to Pollutants in the Clark Fork River near Missoula, Montana. Water Research Project Technical Completion Report. University of Montana.
- Vincent, E. R. 1971. River electrofishing and fish population estimates. Progressive Fish Culturist 33(3):163-167.

